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Leon F. Pettinger

Douglas-Fir Tussock Moth Handbook

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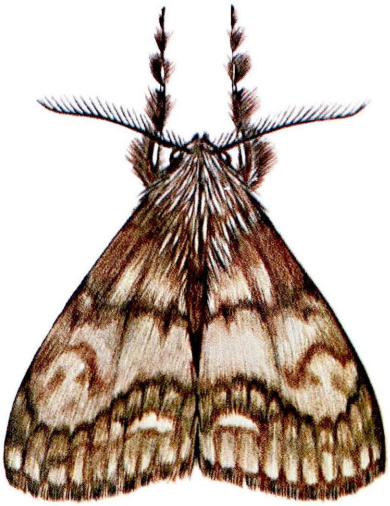

How to Time the Sampling of Tussock Moth Larvae

by B. E. Wickman[1]

In 1974 the U.S. Department of Agriculture initiated the Combined Forest Pest Research and Development Program, an interagency effort that concentrated on the Douglas-fir tussock moth in the West, on the southern pine beetle in the South, and on the gypsy moth in the Northeast. The work reported in this publication was funded in whole or in part by the program. This manual is one in a series on the Douglas-fir tussock moth.

Forest managers and entomologists concerned about outbreaks of the Douglas-fir tussock moth in the West need to keep close track of increasing insect populations. This is best done in the spring, soon after the larvae emerge from the egg masses and move to the newly flushed foliage to feed.

In the past, early instar larval sampling times were based on estimates of the date of egg hatch. But predicting exactly when egg hatch will occur has been difficult. For one thing, the time of egg hatch varies considerably from year to year and from place to place. In addition, it has been difficult to keep track of the development of the egg masses to know when the larvae begin to emerge. During non-outbreak years, many egg masses are located in the tops of trees where they are hard to see. During an outbreak, egg masses are easy to find in the lower crown — but during later stages of the outbreak many of the eggs in a mass may fail to hatch. This hatching failure can give a false impression of the stage of egg mass development.

[1]Forest Service, Pacific Northwest Forest and Range Experiment Station.

A solution to the problem of timing larval sampling is to keep track of tree development rather than insect development. These are closely linked since the same environmental factors that affect tussock moth egg development also affect the timing of bud burst and shoot elongation in Douglas-fir and true fir. Since the newly hatched larvae feed only on new foliage, they must begin feeding shortly after the new foliage begins to grow or they will starve. It is this synchronization of insect and host development that indicates when to begin sampling early instar larvae. The timing is roughly as follows (± 1 to 5 days):

Stage I
Day 1—first buds burst

Stage II
Day 10—most buds burst, egg hatch begins

Stage III
Day 17—egg hatch peaks

Stage IV
Day 22—larvae dispersing off egg masses, shoots 50 percent or more elongated.

Research has shown that larvae begin to hatch from the eggs at about Day 10, when approximately 90 percent of the tree buds have burst. Due to local environmental conditions, egg hatch can last anywhere from about 6 to 14 days. Thus, while bud burst may be a good indicator of egg hatch, it does not indicate when most of the larvae will have moved off the egg mass and into the foliage. Within a few days, however, insect and tree development become even more closely linked. By the time shoots are about half grown (2 to 3.5 cm long), most of the larvae will have moved off the egg masses and begun feeding (Stage IV). This is the best time to sample for first- and second-instar larvae.

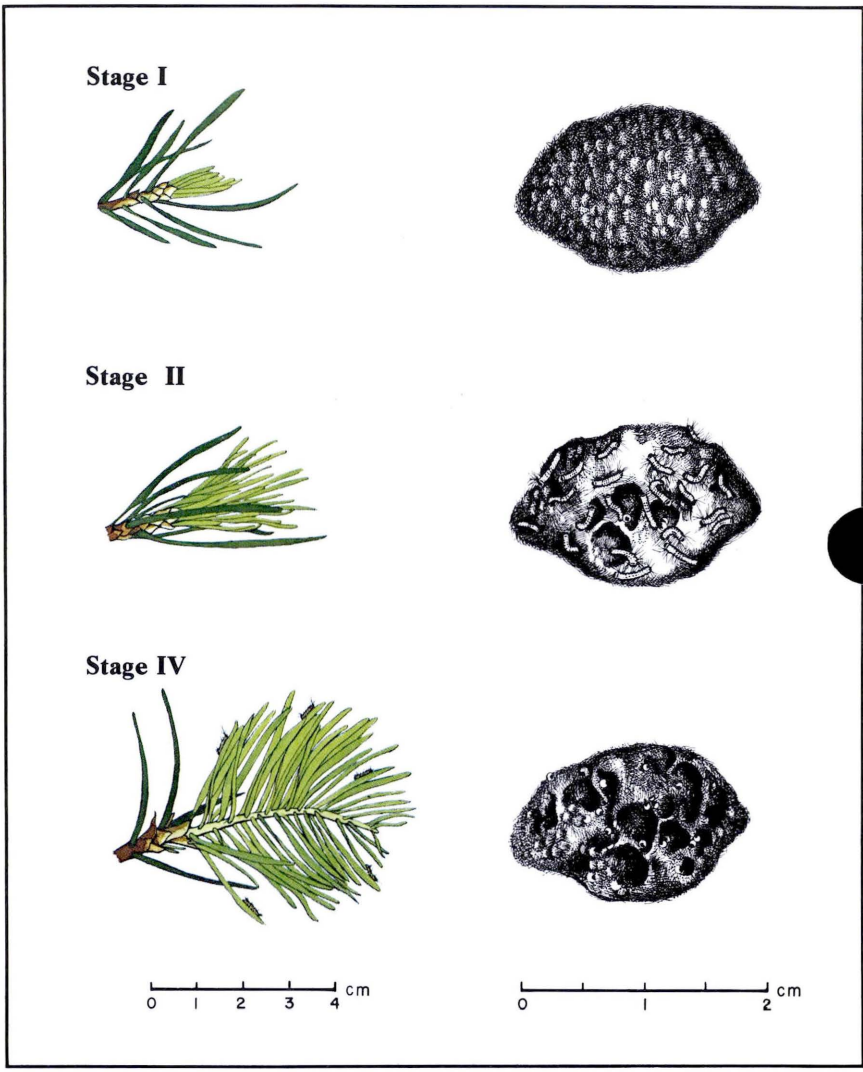

Figure 1.—Tussock moth development is linked with tree development:

Stage I New buds burst, egg hatch imminent
Stage II Most buds burst, some elongation occurs, eggs hatching
Stage IV New shoots about 50 percent elongated, larvae have left egg masses and started feeding.

If possible, tree development should be monitored in the field from before the time of bud burst. This can be done by establishing a series of plots (containing about 10 trees each) at different elevations and then periodically examining the lower and mid-crown foliage. Sometimes it may be impossible to be in the forest this early or for this long. In this case, a usable estimate can be made by measuring shoot growth on several dozen trees in a given location.

To be accurate, insect sampling should be done when the larvae are well dispersed in the foliage. By this [illegible]e, early hatching larvae may have [illegible]sed some defoliation. While this [illegible]mage may be unsightly, it will cause little or no effect on tree growth.

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